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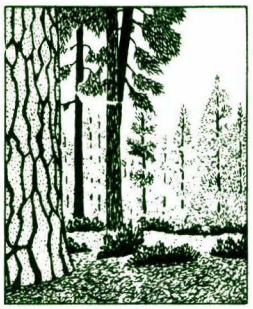

FOREST RESEARCH NOTES

CALIFORNIA FOREST AND RANGE EXPERIMENT STATION
GEORGE M JEMISON, DIRECTOR

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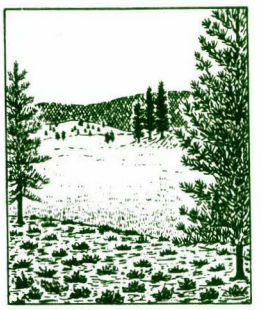

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RANGE SPECIES RECOMMENDED FOR SOWING ON CLEARED BRUSHLAND IN CALIFORNIA[1/]

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The choice of forage plant mixtures to sow on an area cleared of brush is limited by seedbed and site conditions. Where a variety of species can be successfully established, the choice may depend on the kind of cover that is desired. Mixtures adapted to different conditions and objectives are of two general kinds: Those dominated by annual grasses and those dominated by long-lived perennial grasses.

1/ Species are recommended for the chaparral and woodland types in the brushland zone below the commercial timber belt. Excluded are the sagebrush and associated types east of the Sierra-Cascade and the desert shrub types.

The recommendations express the joint conclusions of the four authors representing their respective departments or agencies in the University of California and the United States Department of Agriculture. The authors are indebted to other members of the Extension Service and Forest Service for field tests of species performance and for review of the recommendations and suggestions on preparation of this paper. The recommendations are based on observations of reseeding results extending over a period of nearly 20 years. The recommended basic mixtures are intended for use statewide within the brush zone, but alternate species are suggested for use at the discretion of men with local experience in reseeding.

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Mixtures Dominated by Annuals

Annual grasses are recommended for areas where good stands of perennials cannot be established because of poor sites or unsuitable seedbeds. Annuals are the better choice on most rocky soils about 1 foot deep and on some deeper soils that are coarse textured and excessively drained. Annuals usually are recommended for an area if only small spots have a weed-free seedbed suitable for perennials. Annuals also can be used on burned watersheds where the major objective is a full cover the first 2 years after sowing and range improvement is secondary. On cleared ranges or watersheds recommended for annuals, however, perennials can well be sown on selected areas of suitable site and seedbed.

Annuals should be sown at a rate sufficient to obtain a continuous cover the first year. A full initial stand will take advantage of any temporary increase in soil fertility resulting from brush removal. Sowing of annuals is not worthwhile unless they provide a quick cover and good grazing before a stand of resident annuals becomes established naturally.

Basic Annual Mixture

A basic mixture widely adapted for broadcast sowing in the brushland zone is:

Species:	Pounds per acre
Soft chess	5
Annual legumes	5
	10

Soft chess, a desirable grass widely naturalized in the foothills, has consistently produced good stands from broadcast sowing. It grows well under good conditions and, perhaps more important, is the only commercial species adapted to hard seedbeds and low soil fertility. A distinct advantage of soft chess for range improvement is that it provides only limited competition with other sown species and persists in the grass cover.

Soft chess is commercially available as Blando brome. Seed supplies are limited and the price is relatively high. For these reasons part or most of the soft chess in the basic mixture may have to be replaced by other annual grasses.

Annual legumes should make up about half of an annual-plant mixture wherever improvement of grazing values is desired. Rose clover, subterranean clover, crimson clover, and burclover should be included. Conditions favorable for each species usually occur somewhere within an area to be sown, and a mixture of species gives more consistent production under variable weather conditions.

The grass seed should have a recommended fungicidal treatment and the legume should be inoculated at a heavy rate.

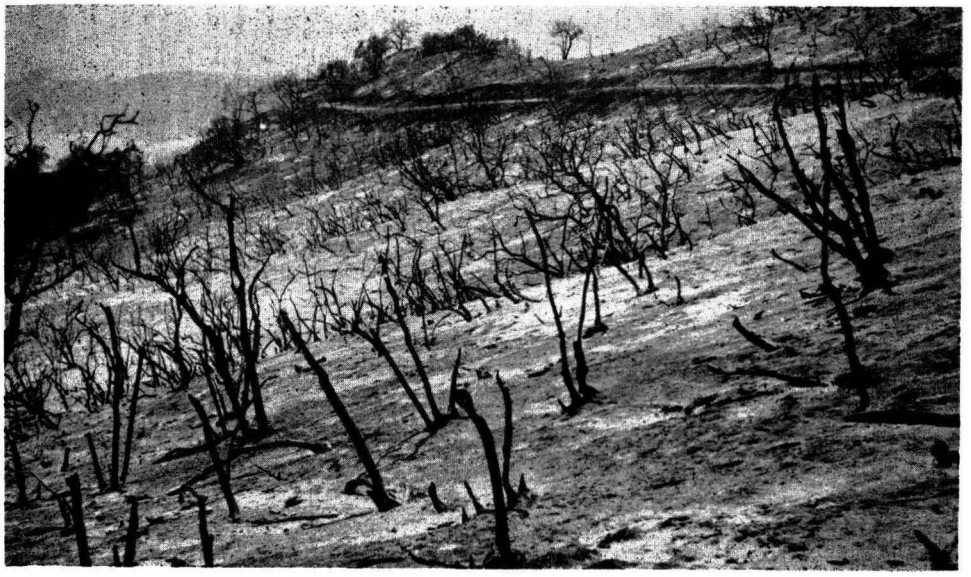
Alternate Species

When soft chess is not available or is too costly, annual ryegrass can replace most of the soft chess in the mixture on many areas. Good mellow seedbeds are needed for broadcast sowing of ryegrass. The seed should be covered mechanically on hard seedbeds or where average precipitation is less than about 20 inches. Soil fertility should be at least fair. Good stands of ryegrass are valuable because of their high production for a few years and their heavy first-year competition with brush seedlings. Ryegrass has two major limitations, however: Excessive competition with other sown forage species and limited persistence in the grass cover. Typically, ryegrass is dominant for only 2 to 4 years and often is replaced by inferior species. On some fertile soils, particularly in the coastal region, ryegrass will become naturalized and persist indefinitely. On such sites it is a first-choice annual grass.

Seed of annual ryegrass is available in quantity at a low price. Sowing at 5 pounds per acre is recommended for a uniform stand. Higher rates are not necessary. Two to 3 pounds will produce good stands in favorable years. Soft chess always should be added at one-half to 2 pounds per acre with the ryegrass. Then soft chess will become established before ryegrass disappears from the cover.

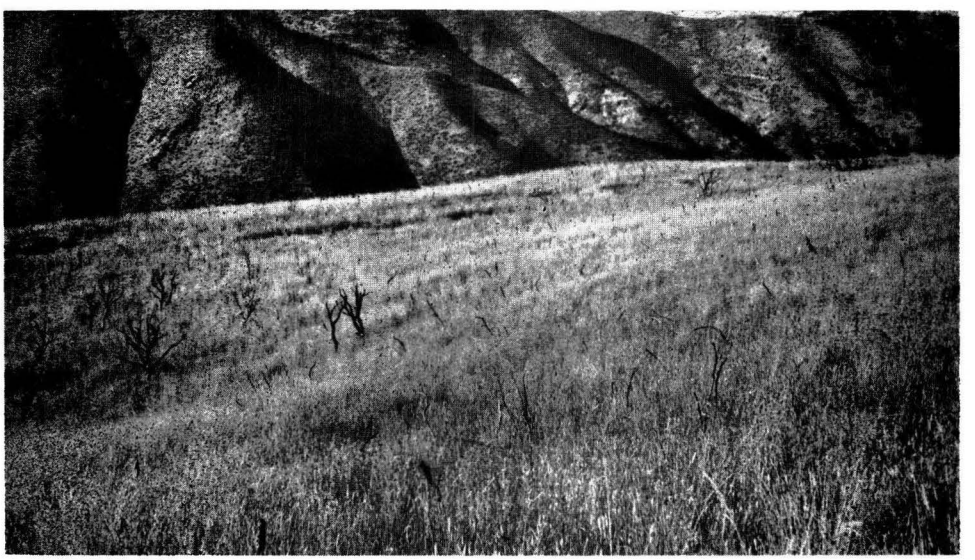
A few short-lived perennial grasses may be included, but the mixture will remain essentially annual in nature. Perennial ryegrass is interchangeable with annual ryegrass on fertile soils where precipitation is greater than about 25 inches per year. Where mountain brome, Harlan brome, or prairie brome have shown exceptional promise they can be added to the basic mixture at about 2 pounds per acre. If ryegrass is the dominant annual in a mixture with perennial bromes, it should be reduced to 2 pounds per acre.

Soft chess sown on area of chamise-chaparral burned for game range improvement. This is best adapted species for broadcast sowing on shallow rocky soils with hard seedbed surface. Mendocino National Forest, Lake County, 1953.



Seedbed favorable for sowing perennials on selected area of productive soil with moderate gradient. Wildfire burn in mature mixed-chaparral has left mellow soil surface with few viable weed seeds. Santa Barbara County, 1955.

Excellent stand of Hardinggrass on productive land where brush was removed by burning. This palatable perennial, which will persist indefinitely if properly grazed, is the basic species for most perennial mixtures. Rescue Range, El Dorado County, 1955.



Perennial grass cover on selected site on chamise-chaparral watershed burned by wildfire. Tall fescue and intermediate wheatgrass replace part of Hardinggrass in the basic mixture. Brush sprouts and seedlings killed by chemical spraying. Mendocino National Forest, Glenn County, 1955.

Veldtgrass, a vigorous reseeding perennial, can be added to the annual grass mixture at 2 pounds per acre in coastal areas, or inland in southern California, on light-textured soils.

Sowing of wild oat is a questionable practice that adds to the difficulty and cost of sowing and appears to give limited return.

Cereal grains, particularly rye, often will provide good temporary cover when sown on good seedbeds at 40-50 pounds per acre. These rates are too high for economical application by aircraft. Soft chess or ryegrass can be used more economically and will give better success on most seedbeds.

Mixtures Dominated by Perennials

Perennial grasses can be used to improve forage values of the herbaceous cover over much of the brush zone--but only if grazing is managed to promote their establishment and continued production. If the decision is to sow perennials, provision for the necessary grazing control should be planned before the area is sown. Perennials may be sown on relatively small areas that can be fenced out as separate units. Or the entire range may be managed so that perennials can be grown wherever soil conditions are favorable. Perennials should not be grazed yearlong, and a rest period during seed production is needed at least once in 3 years.

Perennial grasses are recommended for sowing where adapted because they are superior to annuals. They are deeper rooted and have a more stable production of usable herbage over a longer period of the year. The extent to which the increased costs and greater care necessary to establish and maintain perennials may be economically justified has not been determined for many conditions on livestock, game, or dual-use ranges. However, worthwhile improvement of the cover for grazing or soil protection is obvious on many areas where perennials have been successfully established.

A successful burn in dense brush will provide the relatively weed-free seedbed required for a full stand of perennials. Areas cleared by bulldozing or disking are sufficiently weed-free if few annuals were present before clearing, or if annuals were reduced by thorough cultivation in the spring before they produced seed. A burn in open or semidense stands of brush usually is poor for sowing of perennials unless the competing plants have been reduced by cultivation, or sowing is confined to the small spots of clean seedbed.

Perennial grasses can be successfully grown inland where precipitation averages about 25 inches or more and soils about 2 feet deep or deeper, except on coarse-textured soils that are excessively drained. If precipitation averages less than 25 inches, the soil should be deeper than 2 feet. Texture should be loam to clay loam or the subsoil should be heavy clay.

Perennials will succeed in coastal areas under precipitation considerably less than that required inland.

Where mixtures dominated by perennials are to be sown, the objective should be to obtain a full stand of the long-lived species during the first year, when competition is at a minimum. Therefore, heavy seeding rates are recommended.

Basic Perennial Mixture

A basic mixture recommended for broadcast sowing in the brushland zone is

Species:	Pounds per acre
Hardinggrass	5
Smilo	2
Soft chess	1/2 - 2
Legumes	4
	11 1/2 - 13

If the mixture is drilled the total rate per acre can be reduced to about 50 percent of the broadcast rate, but the species proportions should be the same. Drilling is recommended for best establishment of perennials although good stands often have been obtained by broadcast sowing, usually aerial application, on burned brushland.

Hardinggrass should be the major species in perennial grass mixtures over most of the brushland zone. Where adapted it is the most productive, under grazing and reburning, of the long-lived species that are commercially available.

Above elevations of about 3,000 feet at the north end of the brushland zone and above 5,000 feet at the south, winters are too cold and long for best production of Hardinggrass. Here, some other species can be used as the major one in a perennial grass mixture.

Because seed of Hardinggrass is in short supply, other species may need to be substituted for part of the Hardinggrass on many areas, but at least 3 pounds of Hardinggrass seed per acre should be included where it is broadcast sown.

Smilo is another long-lived species recommended for the basic mixture of soils where Hardinggrass is adapted, and smilo will survive on shallower soils underlain by highly fractured substratum. Smilo is particularly suited for broadcast sowing on areas of burned chamise-chaparral. The rate may be increased to replace part of the Hardinggrass in the basic mixture where precipitation averages less than 20 inches. Seed supplies are adequate and the price is reasonable.

Soft chess is recommended for the basic mixture to fill in the interspaces between perennials during the second and third years after sowing. Sown at 1/2 to 2 pounds per acre, it will produce an adequate amount of well distributed seed but will not compete excessively with perennial grass seedlings.

The mixture should include several annual legumes to increase production and grazing values. Those recommended are rose clover, subterranean clover, crimson clover, and burclover. Alfalfa may be used as one of the legumes without danger of excessive competition. Ordinarily it produces satisfactory stands when sown on deep soils of neutral or slightly alkaline reaction but adds little to total herbage production. Alfalfa stands often are decimated by rodents.

All grass seed should have recommended fungicidal treatment and the legume seed should be inoculated at a heavy rate.

Alternate Species

Orchardgrass and Tualatin tall oatgrass are best adapted at the north end of the brushland zone and in the North Coast Ranges where annual precipitation is greater than 30 inches. Here, either species can replace part of the Hardinggrass in the basic mixture on the best sites. On other sites, adding about one-fourth pound of orchardgrass per acre to the basic mixture will provide many new seedlings the second year after sowing. At higher rates orchardgrass competes excessively with Hardinggrass and smilo the first year. At elevations too high for best growth of Hardinggrass in northern and central California, orchardgrass or Tualatin tall oatgrass may replace it as the major species in the mixture. Fresh seed of tall oatgrass should be used because germination of this species falls off rapidly as the seed ages.

Tall fescue or intermediate wheatgrass, or both, may be used within the brushland zone in northern and central California where annual precipitation averages more than 25 inches, to replace about 2 pounds of Hardinggrass in the basic mixture. These species, too, can be used as the major species at elevations too high for best growth of Hardinggrass.

Big bluegrass is widely adapted in northern and central California. It may be added to the basic mixture or used to replace part of the annual grass in the mixture.

Veldtgrass is best adapted in southern and coastal California, where it grows well on light-textured soils. On such sites it is recommended to replace part of the Hardinggrass in the basic mixture.

Intermediate wheatgrass probably is more productive on cleared brushland north of the Sacramento Valley, but three other wheatgrasses--pubescent, tall, and crested--also are adapted in this region. These wheatgrasses are recommended for sowing on a trial basis in southern California at elevations too high for Hardinggrass, particularly on the desert side of the mountains.

Highland bent, creeping red fescue, Chewings fescue, and hard fescue are recommended for trial sowings at elevations too high for Hardinggrass. They should be tested where a good ground cover is needed on soils with neutral to acid reaction in areas of good precipitation.

Birdsfoot trefoil is a perennial legume that may be added if desired. It has about the same soil requirements as alfalfa but has not been so widely successful. Burnet is a non-leguminous perennial that usually produces fair to good stands on favorable sites when sown at 1 or 2 pounds per acre, and it persists for many years on some areas. It usually adds little to the forage available to livestock, partly because of heavy deer grazing on this species. Burnet should have more trial on deer ranges.

If annual or perennial ryegrass is used instead of soft chess, it should not be sown at a rate greater than one-half pound per acre because ryegrass is extremely competitive. One of the short-lived perennial bromes may be added at a low rate along with an annual grass in the mixture.

COMMON AND BOTANICAL NAMES OF SPECIES MENTIONED

Alfalfa	Medicago sativa
Bent, Highland	Agrostis tenuis
Bluegrass, big	Poa ampla
Brome, Blando	Bromus mollis
Brome, Harlan	Bromus stamineus
Brome, mountain	Bromus marginatus
Brome, prairie	Bromus catharticus
Burclover	Medicago hispida
Burnet	Sanguisorba minor
Clover, crimson	Trifolium incarnatum
Clover, subterranean	Trifolium subterraneum
Clover, rose	Trifolium hirtum
Fescue, Chewings	Festuca rubra var. commutata
Fescue, creeping red	Festuca rubra
Fescue, hard	Festuca ovina var. duriuscula
Fescue, tall	Festuca arundinacea
Hardinggrass	Phalaris tuberosa var. stenoptera
Oatgrass, Tualatin tall	Arrhenatherum elatius
Orchardgrass	Dactylis glomerata
Rye	Secale cereale
Ryegrass, annual	Lolium multiflorum
Ryegrass, perennial	Lolium perenne
Smilo	Oryzopsis miliacea
Soft chess	Bromus mollis
Trefoil, birdsfoot	Lotus corniculatus
Veldtgrass	Ehrharta calycina
Wheatgrass, crested	Agropyron desertorum
Wheatgrass, intermediate	Agropyron intermedium
Wheatgrass, pubescent	Agropyron trichophorum
Wheatgrass, tall	Agropyron elongatum
Wild oat	Avena fatua